RebornEndo®

Multifunctional Endo Motor
Instruction Manual

Dentalzone



R-Smart Plus +

Dentalzone

Contents

1 Product Description 5
1.1 Product Introduction 5
1.2 Model and Specification 5
1.3 Performance and composition 5
1.4 Scope Of Application 5
1.5 Contraindications 5
1.6 Warning 6
1.7 Instrument Safety Classification 6
1.8 The Main Technical Parameters 7
2 Functional Overview 7
2.1 Operation Mode And Memory Mode 8
2.1.1 Optimum Glide Path Function（OGP） 8
2.1.2 Optimum Torque Reverse Function（OTR） 9
2.2 Memory Mode 10
2.2.1 Self-defined Mode & Preset File-parameter Mode 10
2.2.2 SGP（T-Mode） 11
2.2.3 AIC Full Automatic function 11
2.2.4 The way to call preset parameters of file 12
2.2.5 The way to call parameters of removing broken file 12
3 Symbol instruction 14
4 Parts Identification and Display Screens 15
4.1 Parts Identification 15
4.2 Components and Accessories 15
4.3 Operation 15
5 Operation 16
5.1 Before Use 16
5.1.1 Product Installation 16
5.1.2 Calibration 17
5.2 In use 18
5.2.1 Operation of self-defined Mode 18

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5.2.2 Preset file-parameter mode 28
5.2.3 Advanced mode setting 28
5.3 After Use 29
5.3.1 Regular Inspection 29
5.3.2 Maintenance 30
6 Troubleshooting 33
7 Safety precautions 34

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1 Product Description

1.1 Product Introduction

Multifunctional Endo Motor is a medical device for dentists to perform endodontic treatment. It can be used as a Endo Motor for preparation and enlargement of root canals, or device for measuring canal length. It can be used to enlarge the canals while monitoring the position of the file tip inside the canal.

The main features of the devices are:

1. Cordless portable endo motor with combined length determination.
2. Intelligent matrix anti-interference apex locating algorithm.
3. 360 degrees rotation of contra angle.
4. AIC automatic intelligent adaptive system algorithm.
5. RBF mode to remove the broken file in the canal root.
6. Bluetooth data transmission.
7. Optimum apical action.
8. Optimum Glide Path Function.
9. Optimal self-adaption and trigger torque mode.

1.2 Model and Specification

Model：R-Smart Plus +

Product Size：135mm×100mm×115mm

Product Weight：347g.

1.3 Performance and composition

The device is composed of main unit, handpiece, contra angle, measuring wire, lip hook, file clip, Silicone sleeve , power adapter and handpiece stand.

1.4 Scope Of Application

The device can be used for preparation and enlargement of root canals, or device for measuring canal length.

It can only be used by professional dentists in hospital environment, clinic in accordance with national regulations.

1.5 Contraindications

It is forbidden to use this instrument in the following situations：

1.5.1 The doctor with a pacemaker is disabled.

1.5.2 Patients with cardiac pacemakers (or other electrical equipment) are warned not to use small appliances (such as Electric razors, hair dryers, etc.) patients are disabled.

1.5.3 Hemophilia patients are banned.

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1.5.4 Use with caution in patients with heart disease, pregnant women and young children.

1.6 Warning

This section contains descriptions of serious side effects and potential safety risks for the product itself and users/patients. The following warning clauses must be read before use:

1.6.1 The instrument can only be used by professional dentists in accordance with national regulations.

1.6.2 The instrument can only be used in designated places and cannot be used outdoors.

1.6.3 The instrument requires special precautions regarding electromagnetic compatibility (EMC) and must be in strict accordance with the EMC information for installation and use. Do not use this equipment especially in the vicinity of fluorescent lamps, radio transmitting devices, remote control devices, handheld and mobile high frequency communication devices.

1.6.4 It is forbidden to expose the instrument directly or indirectly to a heat source. The instrument must be operated and stored in a safe environment.

1.6.5 It is forbidden to use it under conditions with flammable anesthetic mixtures.

1.6.6 Do not immerse it in liquid.

1.6.7 Only suitable for original accessories.

1.6.8 Please use original power adapter. Other power adapter will result in damage to lithium battery and control circuit.

1.6.9 Do not use damaged or defective instruments.

1.6.10 Do not carry out any repairs or modifications without authorization. In case of failure, please contact your local dealer and do not allow unauthorized personnel to repair.

1.6.11 Please do not make any changes to the device. Any changes may violate safety regulations, causing harm to the patient. There will be no promises of any modification.

1.6.12 Please confirm whether the file is well installed and locked before starting the motor handpiece.

1.6.13 The instrument complies with electromagnetic compatibility standards, but it is still necessary to prevent possible risks caused by electromagnetic interference.

1.6.14 Please remove the battery if the motor handpiece is not likely to be used for some time.

1.7 Instrument Safety Classification

1.7.1 Type of operation mode: Continuous operating device.

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1.7.2 Type of protection against electric shock: Class II equipment with internal power supply.

1.7.3 Degree of protection against electric shock: B type applied part.

1.7.4 Degree of protection against harmful ingress of water: Ordinary equipment (IPX0).

1.7.5 Degree of safety application in the presence of a flammable anesthetic mixture with air, oxygen, or nitrous oxide: Equipment cannot be used in the presence of a flammable anesthetic mixture with air, oxygen, or nitrous oxide.

1.8 The Main Technical Parameters

1.8.1 Lithium battery：7.2V/ 1500mAh

1.8.2 Power Adapter：

Input： ~ 100V-240V 50Hz/60Hz 0.5A

Output：DC 5V/ 2A

1.8.3 Speed rang：100-1000rpm

1.8.4 Torque rang：0.4~5.0 N.cm

1.9.5 Environment parameters:

1）Environment temperature: 0 ~ 40℃

2）Relative Humidity:10 ~ 85%RH

3）Atmospheric pressure:70kPa ~ 106kPa

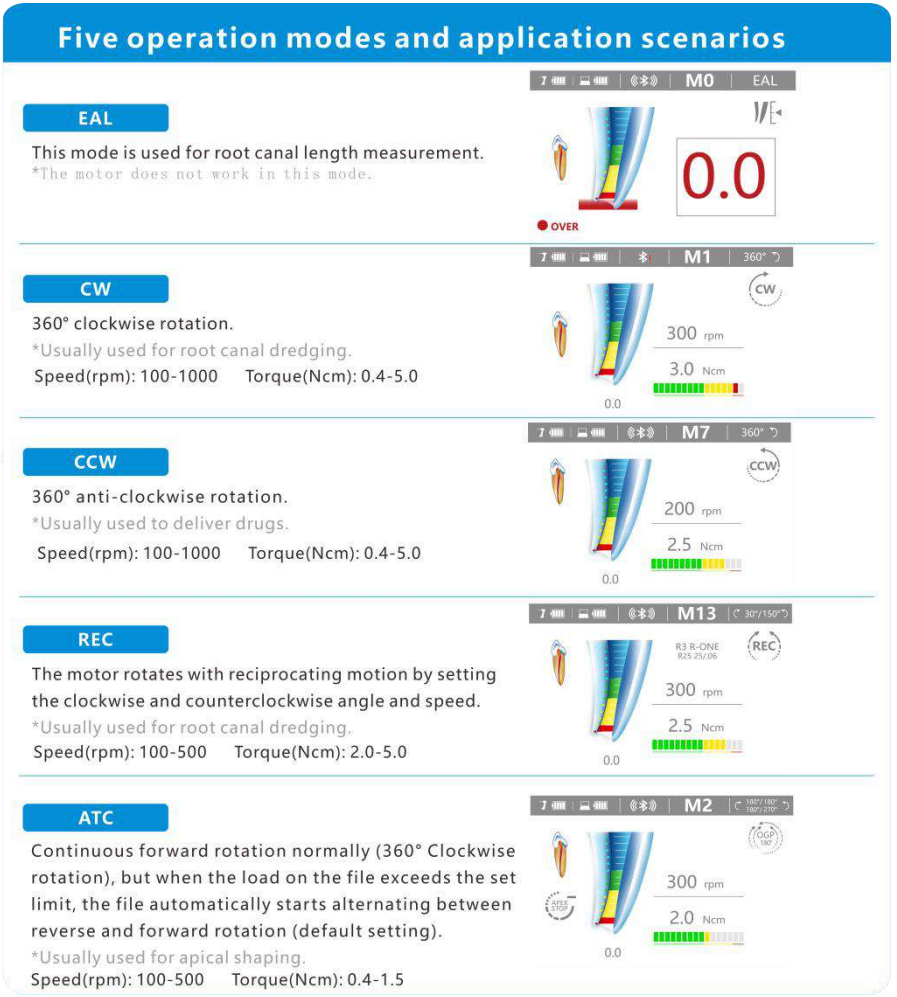
2 Functional Overview

This device provides root canal enlargement and root canal length measurement functions for root canal treatment. The treatment objects are divided into ordinary root canals and complex root canals.

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2.1 Operation Mode And Memory Mode

The device provides 5 operation modes, which can be operated and used according to the user's expected needs. The 5 operation modes and application scenarios are:



2.1.1 Optimum Glide Path Function（OGP）

Optimum Glide Path Function（OGP）:

A Motion:

180°clockwise, and then 180°anti-clockwise reverse rotation.

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B Motion:

180°clockwise, and then 270°anti-clockwise reverse rotation.

Repeat the watch-winding (A) motion and balanced force (B) motion.

OGP can be set the status (ON/OFF) in REC mode.

If the OGP function is the 'ON' status,the instrument operates according to the motion mode of OGP mentioned above. In this case, the instrument can not set the forward and reverse rotation angles.

If the OGP function is the 'OFF 'status,the instrument can set the forward and reverse rotation angles. Adjustment range of forward / reverse rotation angle:30 °- 370 °. It can increase or decrease the angle by pressing '<' / '>'.

The angle adjustment step value is 10 °. It is recommended that the sum of forward rotation angle and reverse rotation angle should be greater than or equal to 120 °.

OGP is applicable to W-One/ R-One (R3 Endo File) produced by the equipment manufacturer or other similar Endo File.

2.1.2 Optimum Torque Reverse Function（OTR）

Optimum Torque Reverse Function（OTR）:

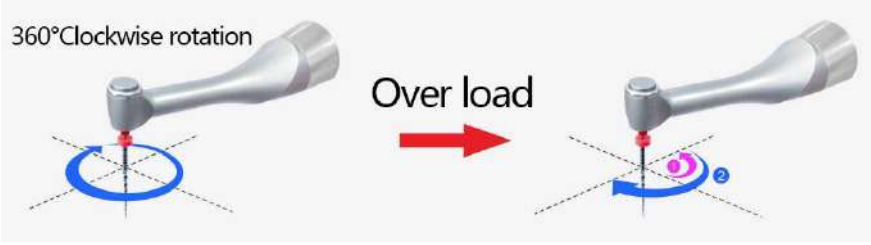
Continuous forward rotation normally (360°Clockwise rotation) , but when the load on the file exceeds the set limit, the file automatically starts alternating between reverse（Motion 1） and forward (Motion 2) rotation (default setting). When the load on the file below the set limit again, the file recovery 360°Clockwise rotation.

Motion 1:

90°anti-clockwise reverse rotation.

Motion 2:

180°clockwise rotation.



OTR can be set the status (ON/OFF) in ATC mode.

If the OTR function is the 'ON' status,the instrument operates according to the motion mode of OTR mentioned above.In this case, the instrument can not set the forward and reverse rotation angles.

If the OTR function is the 'OFF' status, the instrument can set the forward

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and reverse rotation angles. Adjustment range of forward / reverse rotation angle:30°- 370°. It can increase or decrease the angle by pressing '<' / '>'.

The angle adjustment step value is 10 °. It is recommended that the sum of forward rotation angle and reverse rotation angle should be greater than or equal to 120 °.

OTR is applicable to W-One/ R-One (R3 Endo File) produced by the equipment manufacturer or other similar Endo File.

2.2 Memory Mode

2.2.1 Self-defined Mode & Preset File-parameter Mode

This equipment is designed with 18 memory modes (11 self-defined modes and 7 preset file-parameter modes) .

M0 to M10 memory mode are self-defined modes.

The 11 self-defined modes can complete a whole endo treatment.

Especially, almost all canals can be treated with the default settings of the memories from M0 to M3. However, settings can be changed to suit various stages of treatment.We recommend using the default settings until the user has gotten used to how the instrument works.

Memory mode	Main uses with default setting	Operation mode	Applicable scene	Default speed (rpm)	Default torque（Ncm）
M0	Canal measurement	EAL	Apex locating	—	—
M1	Shape the upper part of the canal	CW	Treatment of normal canal	300	3.0
M2	Negotiation and making a glide path for a normal canal	REC	Treatment of normal canal	300	2.0
M3	Canal shaping for a normal canal	ATC	Treatment of normal canal	300	1.0
M4	Negotiation and making a glide path for a complex canal	REC	Treatment of complex canal	100	2.0
M5	Making a glide path for a complex canal	REC	Treatment of complex canal	300	2.5
M6	Canal shaping for a complex canal	ATC	Treatment of complex canal	300	1.0
M7	Injection solutions such as calcium hydroxide, etc	CCW	Injection solutions	200	2.5
M8	SGP	T-Mode	Elimination of root canal steps	300 (SGP speed）	/
M9	Full Automatic mode	AIC	AIC automatic intelligent adaptive system algorithm	—	—

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M10	Remove Broken File mode	RBF	Remove the broken file in the root canal	500	3.0
M11	Preset File-parameter Mode	CW	Store file parameters of RebornEndo	300	3.0
M12	Preset File-parameter Mode	REC	Store file parameters of main brands and RebornEndo	300	2.5
M13	Preset File-parameter Mode	REC	Store file parameters of main brands and RebornEndo	300	2.5
M14	Preset File-parameter Mode	REC	Store file parameters of main brands and RebornEndo	300	2.5
M15	Preset File-parameter Mode	REC	Store file parameters of main brands and RebornEndo	350	2.0
M16	Preset File-parameter Mode	REC	Store file parameters of main brands and RebornEndo	350	2.0
M17	Preset File-parameter Mode	REC	Store file parameters of main brands and RebornEndo	350	2.0

M9: Full Automatic mode. Operator can refer to this manual (chapter:2.2.2) for details.

M10: Remove Broken File mode. Operator can refer to this manual (chapter:2.2.4) for details.

M11 to M17 memory mode are preset file-parameter modes.

The 7 preset file-parameter modes are used to store file parameters of main brands by a cloud storage system, which is convenient for users to call parameters store according to their needs.

2.2.2 SGP（T-Mode）

In T-mode, if the main button is triggered for the first time, the motor will run in SGP mode. If the main button is pressed again, the motor will run in the mode preset by the user.

2.2.3 AIC Full Automatic function

The AIC function is a Full Automatic mode. It built in a set of AIC automatic intelligent adaptive system algorithm. It does not need any parameter settings. Operator can choose the AIC function and uses it immediately.The AIC function is suitable for 360 ° continuous rotary file at low speed with CW/CCW.

This function is only effective when endo preparing accompanied by root canal length measurement. When the file keeps 360 °continuous rotation, the instrument can intelligently analyze and automatically adjust the rotation mode, speed and torque according to the resistance of the root canal file in the root canal, different root canal conditions and the position from the apical point automatically measured. The AIC function meets the requirements of safe and efficient root canal shaping. And the AIC function set at M8 mode.

2.2.4 The way to call preset parameters of file

Press the File key,call the parameters of main brands endo file (include RebornEndo R3 file and other main brands file) for choose. After selecting the file parameters, the system will store the selected file parameters in M12.

M11： Press the File key, call the parameters of RebornEndo R3 file for choose. After selecting the file parameters, the system will store the selected file parameters in M11.

M12-M17：Press the File key,call the parameters of main brands endo file (include RebornEndo R3 file and other main brands file) for choose. After selecting the file parameters, the system will store the selected file parameters in the current mode program.

Note:

The parameters stored by default are for reference only.The specific parameter setting must be based on the actual clinical operation process, combined with the actual root canal environment, the recommended value of the file manufacturer, etc.Users need to adjust appropriate parameters and operation modes according to the actual situation.

The way to call preset parameters of endo file in R-Smart Expert/ W-Expert、R-Smart Classic/ W-Classic is similar with the above explains.

2.2.5 The way to call parameters of removing broken file

M10 (RBF)：M10 stores the parameters of main brand instruments used for removing broken file.It usually includes the storage of parameters and motion modes of the instruments of main brands such as G-drill and Ring-drill.The system will automatically match the corresponding motion mode and store it in M10. Users do not need any setting parameters.

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Normal Canals
Canals with normal shapes.
This is for most canals.



Complex Canals
Extremely curved canals, ledged canals, blocked canals,etc.



Linkage to Canal Measurement Function
If the contrary electrode is applied to the patient, the instrument can be linked to the canal measurement function while it is being used.

Canal Shapes

Almost all canals can be treated with the default settings of the memories from M0 to M3.

Chapter2.2.1

If using this instrument for the first time, refer to "Canal Shaping (for normal canals)".

Chapter2.2.1

Modes

The Endo Motor has 5 different operating modes which can be used for depending on your intended use.

Chapter2.2.1

Memories

There are 17 memories with different combinations of motor operation,speed etc. that can be used at Memory settings can be customized.

Chapter2.2.1

Canal Treatment

Turn Power on
Press the Main switch.

1 Upper Part Shaping
Enlarge the upper part of the canal to make treatment easier.



Normal Canals
Memory: M1
Mode: CW
Chapter2.2.1



Complex Canals
Memory: M1
Mode: CW
Chapter2.2.1

2 Canal Measurement
Measure the canal to determine the working length.



Normal Canals
Memory: M0
Mode: EAL
Chapter2.2.1



Complex Canals
Memory: M0
Mode: EAL
Chapter2.2.1

3 Glide Path
Use a proper file to make the glide path needed for shapping.



Normal Canals
Memory: M2
Mode: REC/OGP
Chapter2.2.1



Complex Canals
Memory: M4/M5
Mode: REC/OGP
Chapter2.2.1

* REC working mode is recommended for M2/4/5.

4 Canal Shaping
Change file sizes as you shape the canal.



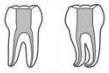
Normal Canals
Memory: M3
Mode: ATC/OTR
Chapter2.2.1



Complex Canals
Memory: M6
Mode: ATC/OTR
Chapter2.2.1

* ATC working mode is recommended for M3/6.

5 Drug Delivery
The motor rotates counterclockwise. M7 is mainly used for delivering therapeutic drugs.



Normal /Complex Canals
Memory: M7
Mode: CCW
Chapter2.2.1

Turn Power Off
Press the Main switch.

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3 Symbol instruction



Switching button



Volume Modulation



Refer To The Instruction Manual Before Use



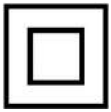
Indoor Use Only



Direct Current



Cautions! Refer to attached documents



Class II Equipment



B type applied part



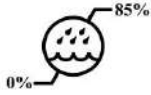
Retrieve



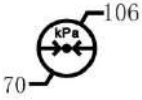
Keep Dry



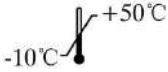
Fragile products



Humidity limit for storage: 0% ~ 85%



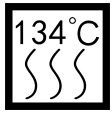
Atmospheric pressure for storage: 70kPa—106kPa



Temperature limit for storage: 10°C ~ +50°C



Dispose of waste products and accessories in accordance with the "Waste Electronic Equipment (WEEE) Directive (2002/96/EC)"



134°C disinfection and sterilization

4 Parts Identification and Display Screens

4.1 Parts Identification



4.2 Components and Accessories



Contra Angle



Silicone sleeve



Battery



Power adapter



lip hook



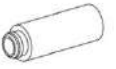
Probe



File Clip



Measuring wire



Oil filling nozzle

4.3 Operation

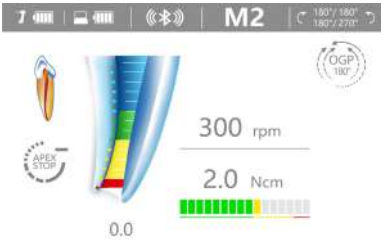


Fig. 4.3.1 LCD screen



Fig. 4.3.2 Operation panel

5 Operation

5.1 Before Use

5.1.1 Product Installation

a）Installation of Contra Angle

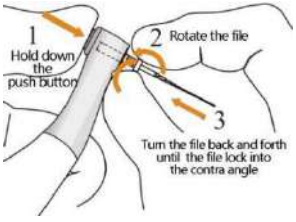
Align any locating pin of the contra-angle with the positioning slot on the motor handpiece and push the contra-angle horizontally. The locating pins on the contra-angle are inserted into those positioning holes on the motor handpiece. A “click” sound indicates that the installation is in place. The contra-angle can be rotated 360° freely.

The contra-angle is free to rotate, adapting to the root canal of different positions, and it is convenient to watch the screen when operating.

Gently pull the contra-angle to ensure that it is firmly installed.If the connection is not firm, it may cause unpredictable rotation or the contra-angle may separate.what's worse, it may hurt the patient.

b）Installation of file

Before starting the device, plug the file into the hole of contra angle head. Hold down the push button on the contra angle and insert the file. Turn the file back and forth until it is lined up with interior latch groove and slips into place. Release the button to lock the file into the contra angle.



Warning:

After plugging the file into contra angle, let go the hand on push cover to assure that the file cannot be taken out. Be careful when inserting files to avoid injury to fingers.Inserting and removing files without holding the push button may damage the chuck of contra angle.Please use files with shanks meet the ISO standard.

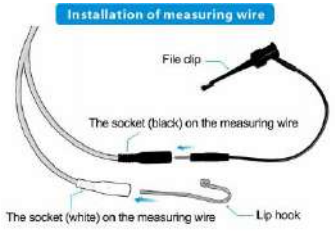
Removal of file: Pressing the push cover, and then directly pull out the file.

Warning:

Before plugging and pulling out the file, the motor handpiece must be stopped. Be careful when removing files to avoid injury to fingers.Removing files without holding the push button will damage the chuck of contra angle.

c）Installation of measuring wire

Connect the measuring wire to the motor handpiece or main unit. Line up the measuring wire plug with the notch on the back of the motor or the left side socket of the main unit and push it all the way in.Connect the file clip plug into the socket (black) on the measuring



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wire. Connect the lip hook to the socket (white) on the measuring wire.

d）Battery Charging

The device can be charged in two ways:

Host charging: Connect the power adapter to the Type-C charging port of the main unit to charge. During the charging process, the screen of the main unit will display the charging status, as shown in Figure 1. After fully charged, the power symbol of the main unit will display a full bar.

Handpiece charging: Connect the plug of the power adapter directly to the Type-C charging interface at the bottom of the fuselage to charge the handpiece directly. During the charging process, the handpiece power indicator flashes. If the handpiece is connected to the main unit via Bluetooth, the main unit screen will display the charging status, as shown in Figure 2. When fully charged, the handpiece power indicator will light up in green.

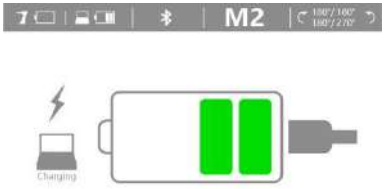


Fig. 1

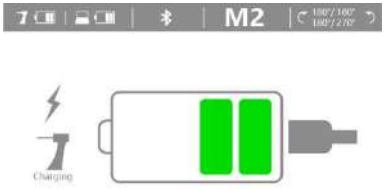


Fig. 2

① By host：Plug the Type-C end of the adapter cable into the charging port of the main unit, and charge the device directly.

② By charger：Plug the Type-C end of the adapter cable into the the motor handpiece.

5.1.2 Calibration

Calibration is automatically performed from 100 to 1,000 r/min.After calibration, operator can press the main switch key ⏻ or wait for several second, and then the instrument will automatically return to the standby screen.

1. Connect the contra-angle to the motor handpiece correctly (It is forbidden to install the root canal file).

2. Press the "Bluetooth" button to select the wireless communication pairing between the contra-angle and the main unit.

3. Press the "System" key to select the automatic calibration mode, and press "<", ">" to select enable.

4. The LCD display of the main unit shows that the automatic calibration is in progress. As shown in Figure 1, the motor handpiece will accelerate from the minimum speed to the maximum speed, so as to automatically measure the inertia and no-load resistance of the contra-angle.

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5. After the calibration is completed, the LCD display of the main unit will prompt completion, as shown in Figure 2, and return to the initial working interface.

Note：

Calibrate the instrument at the following times:

•Right after purchase.

•Whenever the contra angle has been replaced.

•When using a contra angle other than the one that has been calibrated.

•Whenever, in OTR mode, the instrument always alternates between forward and reverse rotation and never rotates forward continuously.

5.2 In use

5.2.1 Operation of self-defined Mode

Enter standby statement

Press the main switch key ⏻ of main unit and handpiece to turn on the instrument. The stand by display will appear.

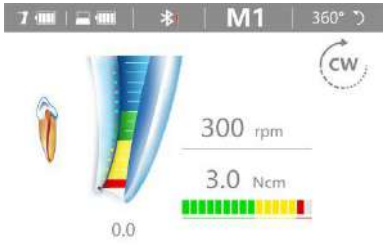
Choose language version



- ❖ The language version can be divided into Chinese and English.
- ❖ The operator can press the System key, then press the “<”, “>” to switch the language version.

Switching memory mode

Press the Mode key of main unit,then press the “<”, “>” to switch the modes.



Set the parameters of memory mode

The parameters of the instrument can be set in the case of no load condition.The parameters including speed, torque, forward rotation angle, reverse rotation angle, apical action, etc.

The specific parameter setting must be based on the actual clinical operation process, combined with the actual root canal environment, the recommended value of the file manufacturer, etc.Users need to adjust appropriate parameters and operation modes according to the actual situation.

If operator need to set the forward and reverse angles, OGP / OTR should be turned off. It can refer to the manual for details according to the chapter.

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It can switch the parameter setting by pressing Mode key.Parameter categories are as follows:

Parameter category	Parameter setting
Operation Mode	Five operation modes used for Endo Motor for preparation and apex locating: EAL、CW、CCW、REC、ATC
Speed	CW、CCW：100~1000 rpm REC、 ATC：100~500 rpm
Torque	CW：0.4~5.0 N.cm CCW：0.4~5.0 N.cm REC：2.0~5.0 N.cm ATC：0.4~1.5 N.cm
Apical Action	Reverse / Stop / OFF/ OAS
Auto Start	ON / OFF
Auto Stop	ON / OFF
Flash Bar Position	Apply to EAL、CW、CCW、REC、ATC
Apical Slow Down	ON / OFF
SGP Angle	Only activating in T-Mode. In the T-mode, the SGP Angle of 30°~370° are available.
SGP Speed	Only activating in T-Mode. In T-mode, the SGP speed of 100~500rpm are available.
Present Mode	Only activating in T-Mode. It has 4 preset modes : CW, CCW, REC, ATC.

Enter the parameter setting interface, it can press the '<', '>' key to change the parameters.

Starting the working state



After the parameter setting is completed the instrument will automatically enter the standby working state. At this time, the instrument motor will work by pressing the main key ⏻ on the main unit.

The instrument motor also can work by opening the auto start function, while it is in the state of endo preparation accompany with apex locating.At this time, once the endo file get into the root canal, it will automatically rotate.

Note: When the motor handpiece is in working state (the motor is running), the keys of the main unit will be locked, and no key selection available. If you need to make a key selection, you need to stop the motor and enter the standby state.

During the operation of the motor, if the load value exceeds the preset

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torque value, the rotation mode of the file will automatically change to the reverse mode. When the load is lower than the preset torque value again, the file rotation mode returns to the forward rotation mode.

Note:

1. The automatic reverse rotation protection function is only applicable to the forward rotation mode.

2. This function is disabled in reciprocating mode and reversing mode.

3. When the motor handpiece power mark on the main unit screen indicates low power, the low power is not enough to support the motor handpiece to reach the limit torque value, then the automatic reverse function will not work properly, please charge it in time.

4. If the motor handpiece is always under load, the machine may automatically stop due to overheating protection. If this happens, turn off the motor handle for a period of time until the temperature of the motor handpiece drops before use.

Bluetooth connectivity



The device has built-in Bluetooth connection function.It can realize the data exchange between various dental medical devices with Bluetooth connection function produced by the equipment manufacturer.At the same time, through the Bluetooth app provided by the equipment supplier, the Bluetooth data interworking between the equipment and the terminal (such as mobile phone) can be realized.

The Bluetooth connection function is enabled as follows:

Press the BLE key, then press '<'、 '>' to chose the MAC address. It can control the status of Bluetooth function.

When the Bluetooth function is turned on, the Bluetooth icon will appear on each memory mode interface.

At the same time, the advanced mode setting also provides the MAC address of the Bluetooth function of the device.It is convenient for other devices to identify the physical address when searching the Bluetooth connection of the device.

Click the Bluetooth button on the main unit button panel, and the main unit screen will display the Bluetooth connection interface as shown on the right.

The ID in the center at the top of the interface is the MAC address of the R-Smart Plus+ main unit, which is convenient to query and enter the R-Smart Plus+ main unit ID when connecting to the mobile APP.

The main unit can automatically search for the Bluetooth MAC address of the connectable device. By pressing the left and right switching keys < >, and

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pressing the Bluetooth key to confirm, you can select different devices to connect.

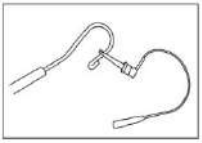
Once the main unit is successfully connected to the MAC address of a certain handpiece, the corresponding MAC address will turn into a green state of successful connection.

At the same time, the Bluetooth indicator on the handpiece will be solid blue.

Note: Be sure to use the original main unit and the original handpiece of the same model for Bluetooth connection, otherwise the treatment process may cause unforeseen problems.

Apex Locating function

Press the Power key on the main unit, then press the Mode key or "<", ">" to switch the mode into the EAL mode.





* M0 is the Apex Locating mode by default.It is necessary to connect the measuring wire with the file clip and the lip hook, and place the lip hook in the corner of the patient's mouth.

* Only Apex Locating function: Either socket of the measuring wire can be connected with file clip or lip hook.
* Endo preparation accompany with apex locating function :Connect the file clip plug into the socket (black) on the measuring wire. Connect the lip hook to the socket (white) on the measuring wire.

The measured numbers do not represent the actual length from the apical foramen. It simply indicates the file progression towards the apex. The digital number "00" indicate that the file has reached the apex foramen. Subtract 0.5-1mm from the measured file length as the working length. These numbers are used to estimate the canal's working length.Accurate measurement is not always possible, especially in cases of abnormal or unusual root canal morphology. Make sure to take an X-ray to check the results.

Strongly recommend check the connection testing every time before use. Clip the holder onto lip hook and check that all the bars on the meter on the screen light up, otherwise, the measuring wire or file clip should be replace.

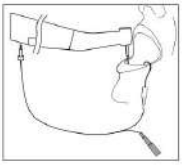
Endo preparation accompany with apex locating function

When using motor combined canal measurement function, the measuring wire must be connecting with motor handpiece by Type-C socket, and white socket connects with patient's lip by lip hook, keep the black socket idle.

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The canal length indicator bar will show on the screen.Setting parameters of automatic functions as needed, such as Apical Action, Auto Start, etc.





When the user selects M0-M17, if the operation mode is set to the operation mode of the root canal preparation stage (CW/CCW/REC (including OGP)/ATC (including OTR)), then connecting the root measuring wire and the lip hook with the corner of the patient's mouth and mouth, and set the reference point position of the root apex. Then the function of expanding while measuring is selected.

This manual explains the use of the function of expanding while measuring under the M1 memory program. The functions of expanding while measuring under other memory programs can be implemented by referring to the operation of the M1 memory program.

A) Connection of root canal measurement wire

Connect the measurement wire to the connector on the bottom of the device handpiece. Align the measurement wire socket with the corresponding notch on the bottom of the motor and push it all the way in.

Connect the lip hook to the white connector end of the measuring wire, do not reverse it. Connect the measurement wire to the lip hook, and place the lip hook at the corner of the patient's mouth so that it contacts the oral mucosa as a reference electrode. Insert a machine file into the contra-angle handpiece as another reference electrode.

B) Boot into M1 memory program

Press the main switch key of the main unit and the handpiece, the main unit and the handpiece enter the standby state, and check whether the wireless communication connection between the main unit and the handpiece is normal. Then press the mode key on the main unit to switch the memory program to M1 mode.

Note: Before each measurement and preparation, the line connection test must be carried out to confirm that the file clip and the measurement wire are in good contact.

Clamp the file clip to the lip hook, and the indication bar of the apical magnification map should be fully displayed, otherwise the measuring wire or the file clip needs to be replaced.

C) Set the general parameters of the M1 memory program

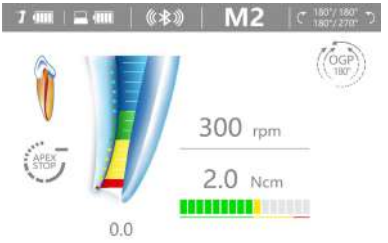
General parameters include: operating mode, speed, torque, etc. Short press the setting key to switch to various general parameter settings in this mode.

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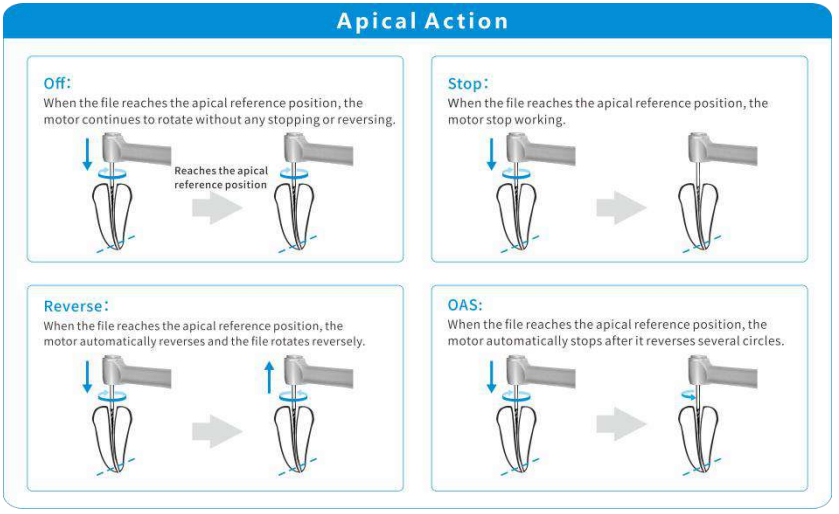
D) Set the important parameters of the preparation function while measuring

Important parameters for preparation while measuring include: apical movement, auto-start, auto-stop, apical reference point flash bar position, and apical deceleration. The above settings allow the device to optimally perform both root canal preparation and root apex positioning.

Apical action



Apical action refers to the action that the file automatically triggers when the file reaches the reference point in the root canal determined by the flash bar setting. You can press the apical action button of the main unit in the operation mode of the root canal preparation stage (CW/CCW/REC (including OGP)/ATC (including OTR)), and the corresponding apical action will appear in the lower left corner of the main unit screen. indicator icon.



Automatic start

This function is only effective in the mode of endo preparation accompany with apex locating.

The automatic start function is on: When the root canal file enters the root canal, the motor starts automatically.

The automatic start function is off: when the root canal file enters the root canal, the motor will not start. At this time, the main switch ⏻ can only be used to start and stop the motor.

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Automatic stop

This function is only effective in the mode of endo preparation accompany with apex locating.

After the automatic stop function is turned on, the root canal file is pulled out of the root canal, and the motor rotation stops automatically.

Root apex positioning reference point selection:



Click the root measurement button on the main unit, and the doctor reference point selection interface shown on the right will appear.

At this time, you can select the value of the doctor's reference point by pressing the left and right switching keys "<"">", the selection range: 0.0-0.7.

After the operator has set the doctor's reference point, during apex locating, when the file is close to the set reference point, the main unit will emit a continuous beep to remind the operator.

After the operator has set the doctor's reference point, during the process of measuring and expanding, when the file is close to the set reference point, the main unit will not only emit a continuous prompt tone, but the apex positioning indicator on the handpiece will also flash blue light to remind the operator.

The apical reference point flash bar position represents the apical reference point position where various apical actions are triggered. The scale and numerical indications on the screen do not represent a definite length or distance, and a decreasing number simply means that the file is moving towards the apex.

Apical slow down

When the root canal file approaches the physiological apex position, the motor rotation speed will automatically slow down.

Turn on apex slow down: the motor will automatically slow down near the apex position.

Turn off apex slow down: the motor will not slow down near the apex position.

Start T-Mode passing step mode



When the device switches to M8: T-Mode, the device starts the passing step mode. The device will run the first-stage process of passing step mode, the device rotates in an equiangular reciprocating mode. The interface of M8 is shown on the right:

When the machine file goes over the

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steps, the operator manually presses the power button on the handpiece, and the second-stage operation of the equipment will switch back to the preset working mode under normal conditions. Pressing the power button on the handpiece again will stop the handpiece from working.

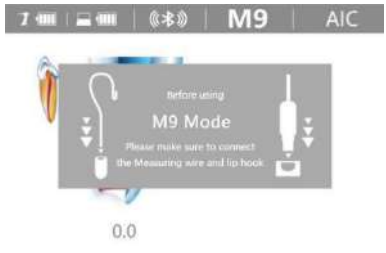
The first-stage process: the file reciprocates over the steps with equal forward and reverse rotation angles, and the default angle of the system is 90°.

The second-stage process: When the file goes over the steps, switch to reciprocating/forward/reverse/intelligent adaptive mode with one key to eliminate steps.

In T-Mode mode, the parameter setting interface is as follows:

Parameter category	Parameter setting
Passing step angle	Setting range of passing step angle: 30-370°
Passing step speed	Step speed setting range: 100-500rpm
Preset working mode	Forward CW, Reverse CCW, Reciprocating REC, Intelligent adaptive ATC
Speed	Forward CW, Reverse CCW: 100~1000 rpm Reciprocating REC, Smart Adaptive ATC: 100~500 rpm
Torque	Forward CW mode: 0.4~5.0 N.cm Inverted CCW mode: 0.4~5.0 N.cm Reciprocating REC mode: 2.0~5.0 N.cm Intelligent adaptive ATC mode: 0.4~1.5 N.cm
Apical action	Reverse / Stop / OFF / OAS
The position of the flash bar	Can be set to 0.0-0.7, and the position of the apical reference point flash bar represents the position of the apical reference point where various apical actions are triggered. The scale and numerical indications on the screen do not represent a definite length or distance, and a decreasing number simply means that the file is moving towards the apex.
Automatic apical deceleration	ON /OFF Applicable to forward CW, reverse CCW, reciprocating REC, intelligent adaptive ATC mode

Start the AIC fully automatic working mode



When the device is switched to M9:AIC the device starts the fully automatic working mode function. Users do not need to set parameters, it can be used immediately after power on. It is suitable for 360° continuous

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rotation of the file at low speed of CW and CCW. This mode is only valid in the case of expanding while measuring.

When switching to M9 mode, the interface will remind the operator to confirm that the measuring wire and the lip hook are connected to ensure that the equipment is working under the condition of measuring and expanding.

The mechanical root canal file rotates 360° continuously, adopts an adaptive algorithm, and at the same time has a built-in root measuring system and the apical action of the root canal file to the apical point. According to the resistance of the file in the root canal and different root canal environment conditions and automatically measure the position from the apex point and intelligently analyze and automatically adjust the rotation mode, speed and torque of the file, improve efficiency and reduce the risk of twisting and breaking of the file, to meet the needs of safe and efficient root canal shaping.

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Root Canals not suitable for Electric Measurement

Root Canals not suitable for Electric Measurement

Accurate measurement cannot be obtained with the root canal conditions shown below.

Root canal with a large apical foramen

Root canal that has an exceptionally large apical foramen due to a lesion or incomplete development cannot be accurately measured. The results may show shorter measurement than the actual length.



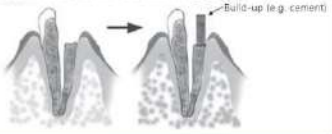
Root canal with blood overflowing from the opening

If blood overflows from the opening of the root canal and contacts the gums, this will result in electrical leakage and an accurate measurement cannot be obtained. Wait for bleeding to stop completely. Clean the inside and opening of the canal throughly to get rid of all blood, and then make a measurement.



Broken crown

If the crown is broken and a section of the gingival tissue intrudes into the cavity surrounding the canal opening, contact between the gingival tissue and the file will result in electrical leakage and an accurate measurement cannot be obtained. In thiscase, build up the tooth with a suitable material to insulate the gingival tissue.



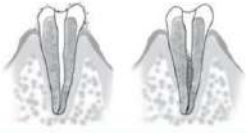
Extremely dry canal

If the canal is extremely dry, the meter may not move until it is quite close to the apex. In this case, try moistening the canal with oxydol or saline.



Cutting debris on tooth Pulp inside canal

Thoroughly remove all cutting debris on the tooth.
Thoroughly remove all the pulp inside the canal. Otherwise an accurate measurement cannot be obtained.



Caries touching the gums

In this case, electrical leakage through the caries infected area to the gums will make it impossible to obtain an accurate measurement.



Fractured tooth Leakage through a branch canal

Fractured tooth will cause electrical leakage and an accurate measurement cannot be obtained.A branch canal will also cause electrical leakage.



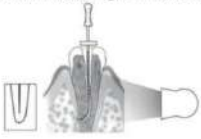
Re-treatment of a root filled with gutta-percha

The gutta-percha must be completely re-moved to eliminate its insulating effect. After removing the gutta-percha, pass a small file all the way through the apical foramen and then put a little saline in the canal,but do not let it overflow the canal opening.



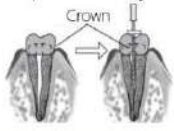
Endo Motor Reading and Radiography

An X-ray image might not show the apex correctly depending on the angle of the X-ray beam, and the location of the apex might seem to be other than it really is.



Crown or metal prosthesis touching gingival tissue

Accurate measurement cannot be obtained if the file touches a metal prosthesis that is touching gingival tissue. In this case, widen the opening at the top of the crown so that the file will not touch the metal prosthesis before taking a measurement.



Stop Working Status

When the root canal motor is rotating, in order to stop the motor rotation, the root canal motor can be stopped by pressing the main switch of handpiece.

You can also find the automatic stop function setting interface by switching the function selection key,when the device run at the status of endo preparation accompany with apex locating.

POWER OFF

In the power-on state, you can long press the handpiece switch key to turn off the handpiece power and stop working.

At the same time, press the switch key of the main unit to shut down the main unit. If the handpiece and the main unit are in the Bluetooth connection state, you need to disconnect the Bluetooth first, and then press the power button of the main unit to shut down.

5.2.2 Preset file-parameter mode

The operation of calling preset file-parameter can be referred to chapter 2.2.1 & 2.2.4 of this manual.

5.2.3 Advanced mode setting

The method to enter the advanced mode setting is as follows：

By pressing the SYSTEM button on the main unit, the system operation interface will be entered, as shown in the right figure.



After the system setting interface appears, you can alternately select different advanced setting functions by pressing the left and right switch keys on the main unit:

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Press the System key in sequence to alternately display different advanced setting function interfaces:

Advanced setting function	Function description
Software Version	The software version number is displayed on the advanced settings page: R-Smart Plus+-X0.Y0.Z0.A01 Please contact the manufacturer for a version upgrade.
Dominant Hand	Set left and right habitual hands, When switching to the left-handed habit, the display interface will rotate 180°, which is convenient for the left-handed operator to observe the displayed content.
Beeper Volume	Adjust the volume, the volume can be set There are four gears from 0 to 3 class.
Restore Default	On/off factory default setting After restoring the factory settings, all parameters will be overwritten by the default parameters After the restoration is complete, the system will remind you that the setting is complete
Auto Return	Automatic return function, can automatically return to the main screen display in 5-60s
Start Up Memory	Used to set the standby screen memory mode entered each time the machine is turned on, Can be set to save the last operation "LAST" Or specify to save any memory mode M0-M15
Calibration	Turn on/off the automatic calibration function, the system will prompt after the calibration is completed.
Auto Power Off	The automatic shutdown time of the equipment can be set to 1-30min.
BLE ON/OFF	Bluetooth connectivity: ON/OFF
BLE MAC	MAC address of Bluetooth

5.3 After Use

5.3.1 Regular Inspection

Maintenance and inspection are generally consider to be the duty and obligation of the user, but if, for some reason, the user is unable to carry out these duties, they may be performed by the accredited service personnel. Contact your local dealer or RebornEndo for details.

This instrument should be inspected every 6 months in accordance with the following maintenance and inspection items.

•Connect the AC adapter to the battery charger, plug it in and check that the Ready LED (green) lights up.

•Make sure there is no dirt, metal fragments etc. on the connection contacts

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for both the motor handpiece end and the battery charger.

•Put the motor handpiece into the battery charger and check that the Charge LED lights up. Check that the battery does not seem to be losing its charge too quickly.

•Check that the connection end of the motor handpiece is not damaged of dirty.

•Check that the connection end of the contra angle is clean and not damaged and that it can be properly connected to the motor handpiece.

•Check that the push button works and a file can be properly installed.

•Check that the external file electrode (option) clips onto the file properly and that it is not worn or damaged.

•Check that the instrument turns on when the Main switch is pressed, and that the instrument turns off when the Select switch is held down and the Main switch is pressed.

•Press the Set switch key to select a memory from M1-M17.

•Check that the settings for each of the memories can be changed.

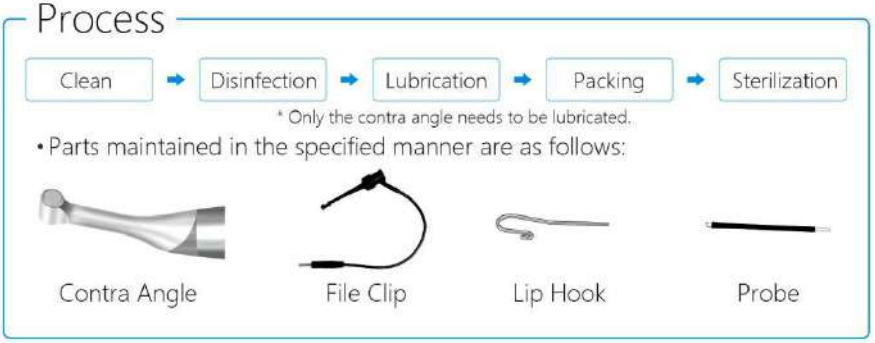
•Make sure the file holder holds a file properly.

•Press the Main switch and make sure that this starts and stops the motor.

•Touch the root canal file with the lip hook and check whether all root canal length indicators on the display are lit.

•Run the motor in the optimal reciprocating motion mode and check if it changes the direction of rotation.

5.3.2 Maintenance



Parts of this equipment that are exposed/frequently in contact with patients need to be cleaned and sterilized by high temperature and high pressure from time to time according to the frequency of use. Items that need key maintenance include: main unit, motor handpiece, file clip, lip hook, probe, , etc.

The procedure is as follows (lubrication only needs to lubricate the bend head)：

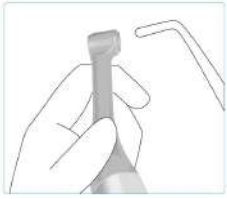
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Cleaning

The cleaning should be performed no later than 24 hours after the operation. The cleaning can be divided into automated cleaning and manual cleaning. Automated cleaning is preferred if conditions permit.



Disconnect the contra angle from the motor hand piece.Clean off the cutting，
Debris with running water and a soft brush and then wipe off the water.



Use a three way syringe etc to blow out any moisture remaining inside the contra angle.

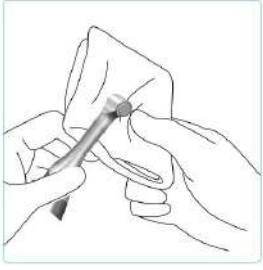
⚠CAUTION

- If a medical agent being used for the treatment has adhered to thecomponents, wash it off in running water.
- Do not clean the components with an ultra sonic cleaning device.

⚠CAUTION

- Check to see if the contra angle including its inside, is completely dry.If any water remains inside the component, expel it with an air gun or another such tool. Failure to do so could result in the remaining water coming out during use and cause malfunction, or poor lubrication and steril -ization.
- If dust or other impurities enter the contra angle, they may cause poor rotation.

Disinfection I



⚠CAUTION

- Do not use anything except Ethanol for Disinfection (Ethanol 70 to 80vol%). Do not use too much ethanol as it could seep inside and damage the contra angle.
- Do not immerse the components in or wipe it with any of the follo -wing:functional water (acidic electrolyzed water, strong alkaline solution, or ozone water), medical agents (glutaral, etc.), or any other special types of water or commercial cleaning liquids. Such liquids may result in metal corrosion and adhesion of the residual medical agent to the components.
- Never clean the contra angle, file holder, or contrary electrode with chemicals such as formalin cresol (FC) and sodium hypochlorite. These will damage the plastic parts of the components. If any of these liquids being applied to the components, wash it off in running water.
- Use only Ethanol for Disinfection (Ethanol 70 to 80 vol%) for cleaning. Any other cleaning chemical or products should not be used including but not limited to the following cleaning products and similar cleaning products listed below because of the potential damage to the plastic components.

Wipe the components with a piece of gauze that has been dampended with Ethanol for disinfection(Ethanol 70 to 80 vol%）and wrung out thoroughly. Disinfection must be performed no later than 2 hours after the cleaning phase. Automated disinfection is preferred if conditions permit.

Lubrication

Only the contra angle needs to be lubricated.

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Lubrication



Cover the contra angle with a piece of gauze or other suitable cloth.



Screw the nozzle onto the spray can.Then insert it into the connection end of the contra angle, and spray for 2s. Using gauze etc to wipe excess spray off the outside of the contra angle.



Stand the contra angle up on a piece of gauze to allow all the excess spray to drain out.

❖ Warning：

① Before autoclaving, the contra angle must be lubricated with original spray of RebornEndo.

② Never direct the spray towards a person.

③ Never use the spray near an open flame.

④ Always shake the spray can two or three times before using it. Use the can in an upright position.

Sterilization

Besides the contra angle，lip hook,file clip,and probe ，any other components can not sterilize under high temperature and high pressure (134℃, 2.0bar~2.3bar (0.20MPa~0.23MPa)) .

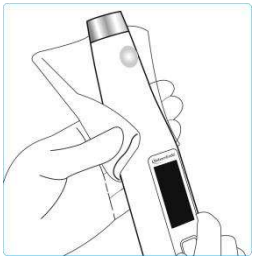
Recommended temperature and time：

The Sterilization of contra angle is under 134℃, 2.0bar~2.3bar, at least for 10 mins.

The Sterilizations of lip hook,file clip,and probe are under 134℃, 2.0bar~2.3bar, at least for 4 mins.

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Disinfection II



⚠CAUTION

- Do not use anything except Ethanol for Disinfection (Ethanol 70 to 80vol%). Do not use too much ethanol as it could seep inside and damage the contra angle.
- Do not immerse the components in or wipe it with any of the follo -wing:functional water (acidic electrolyzed water, strong alkaline solution, or ozone water), medical agents (glutaral, etc.), or any other special types of water or commercial cleaning liquids. Such liquids may result in metal corrosion and adhesion of the residual medical agent to the components.
- Never clean the contra angle, file holder, or contrary electrode with chemicals such as formalin cresol (FC) and sodium hypochlorite. These will damage the plastic parts of the components. If any of these liquids being applied to the components, wash it off in running water.
- Use only Ethanol for Disinfection (Ethanol 70 to 80 vol%) for cleaning. Any other cleaning chemical or products should not be used including but not limited to the following cleaning products and similar cleaning products listed below because of the potential damage to the plastic components.

Wipe the components of motor handpiece, battery charger base, AC adapter, measuring wire with a piece of gauze that has been dampened with Ethanol for disinfection(Ethanol 70 to 80 vol%） and wrung out thoroughly.

The method of disinfection II is only available for motor handpiece, battery charger base, AC adapter, measuring wire, etc.

The above components can not be cleaned with flow water. They are forbidden to sterilize under high temperature and high pressure.

6 Troubleshooting

No.	Failure	Possible cause	Solutions
1	The motor handpiece does not rotate.	1 The load of the file is greater than the set torque limit. 2 when using the mode of endo preparation accompany with apex locating function , operator connects the lip hook to the socket (white) on the measuring wire. 3 Chose EAL mode, EAL mode is only for canal measurement. 4 Strong resistance of contra angle.	1 Increase the setting torque. 2 Connect the file clip plug into the socket (black) on the measuring wire. Connect the lip hook to the socket (white) on the measuring wire. 3 Changing to CW, CCW, REC or ATR mode. 4 Clean or replace the contra angle.
2	The motor handpiece can not reverse automatically.	The setting torque is too large	Decrease the setting torque.
3	Contra angle calibration failure.	Calibration failure caused by strong resistance of contra angle.	Clean the contra angle, and recalibrate after oil injection.

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No.	Failure	Possible cause	Solutions
4	The motor handpiece reverses frequently.	1 The load of the file in the root canal is too large. 2 The root canal is too narrow. 3 The size of file is too thick. 4 Electromagnetic interference	1 Increase the setting torque. 2 Enlarge the root canal appropriately. 3 Replace with the small size file. 4 Stay away from interference sources.
5	No sound	Beeper Volume set to 0. Vol.0: Mute.	Set Beeper Volume to 1,2,3.
6	The device shut down automatically.	1 Long time on the state of standby. 2 The battery is low.	1 Restart the device. 2 Battery charging.
7	The device can not measure the root canal length.	1 The file clip and lip hook connect incorrectly 2 The measuring wire is damaged.	1 Connect the file clip and lip hook correctly. 2 replace a new one.
8	The time of endurance becomes shorter after charging.	Battery capacity becomes smaller.	Please contact local distributor or manufacturer.

* If there are any unsolvable problems, please contact us.

7 Safety precautions

7.1 Please carefully read this Instruction Manual before first operation.

7.2 This device should be operated by professional and qualified dentist in qualified hospital or clinic.

7.3 To ensure that short circuits do not impair the measurements, be particularly careful with patients fitted with metal crowns or bridges. Please confirm the wetness of the endo to ensure the reliability of the measuring. If it is confirmed that the endo file hasn't reached the apex yet the data showed on the apex locator is too low, please check whether the endo is too dry and confirm it with X-ray.

7.4 This device requires special precautions regarding electromagnetic compatibility (EMC) and must be in strict accordance with the EMC information for installation and use. Do not use this equipment especially in the vicinity of fluorescent lamps, radio transmitting devices, remote control devices, handheld and mobile high frequency communication devices.

7.5 Do not directly or indirectly place this device near heat source. Operate and store this device in reliable environment.

7.6 Please set torque and speed as per the recommended specifications of file manufacturer.

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7.7 Any modification will render the guarantee void and may cause harm to the patient.

7.8 The guarantee is valid for normal usage conditions. Any disassembly will render the guarantee void, the professionals of RebornEndo company will offer the repair service during guarantee period.

7.9 Only the original adapter and lithium battery could be used to this machine.

7.10 Please remove the battery if the motor handpiece is not likely to be used for some time.

7.11 Please confirm whether the file is well installed and locked before starting the motor handpiece.

7.12 Please use original components, the components made by other companies may cause inaccurate measurement or immeasurable.

7.13 Before the contra angle stopping rotating, do not press the push cover of contra angle. Otherwise the contra angle will be broken.

7.14 Before the motor handpiece stopping rotating, do not remove the contra angle. Otherwise the contra angle and the gear inside motor handpiece will be broken.

7.15 When the indicating bar reaches the position of the dial 0.0, the endo file has reached the anatomical apical foramen. To guarantee the safety, the work length is clinically obtained by subtracting 0.5-1mm from the length measured by the device.

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